

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Donna Jo Coningsby (Reg. No. 41,684) on 01/25/2010.

Please Amend the Claims as Follows:

1. (Canceled)

2. (Currently amended) The method of claim ~~[[1]]~~ 4, further including:

detecting that the first virtual machine has placed data in the shared physical memory element; and

informing the second virtual machine that data is available in the shared physical memory element.

3. (Canceled)

4. (Currently amended) ~~[[The]]~~ A method of claim 3, comprising:

detecting that a first virtual machine is attempting to transmit data to a second
virtual machine;

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mapping a transmitting memory element of the first virtual machine to a shared physical memory element, wherein the transmitting memory element of the first virtual machine is part of a first virtual device; [[and]]
mapping a receiving memory element of the second virtual machine to the shared physical memory element, wherein the receiving memory element of the second virtual machine is part of a second virtual device;
placing data from the first virtual machine into the shared physical memory element via the transmitting memory element;
receiving the placed data from the shared physical memory element into the second virtual machine via the receiving memory element;
detecting if the first virtual machine is attempting to transmit data to a non-virtual machine; and
dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element.

5. (Currently amended) The method of claim 4, wherein the first virtual device and the second virtual device are devices selected from a group including:

- an Ethernet device,
- a network interface,
- an audio device,

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a storage device, and

a video device.

6. (Original) The method of claim 4, wherein the shared physical memory element is a direct memory access (DMA) buffer.

7. (Currently amended) The method of claim [[1]] 4, wherein detecting that [[a]] the first virtual machine is attempting to transmit data to [[a]] the second virtual machine includes:

monitoring the first virtual machine;

comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine.

8. (Currently amended) The method of claim [[1]] 4, wherein detecting that [[a]] the first virtual machine is attempting to transmit data to [[a]] the second virtual machine includes:

reading a mapping configuration data that specifies default virtual device to physical device mappings;

comparing the mapping configuration data for the first virtual machine to the mapping configuration data of the second virtual machine;

assuming that the first virtual machine is attempting to transmit data to the second virtual machine, if a transmitting virtual device of the first virtual machine is

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mapped to the same physical device as the receiving virtual device of the second virtual machine.

9. (Currently amended) The method of claim 7, wherein mapping ~~[[a]]~~ the transmitting memory element of the first virtual machine to ~~[[a]]~~ the shared physical memory element includes:

determining if the transmitting memory element of the first virtual machine is currently mapped to a transmitting memory element of a physical device;

if so, unmapping of the transmitting memory element of the first virtual machine from the transmitting memory element of the physical device; and

remapping the transmitting memory element of the first virtual machine to the shared physical memory element.

10. (Original) The method of claim 9, further including:

detecting that the second virtual machine is attempting to transmit data to the first virtual machine;

mapping a transmitting memory element of the second virtual machine to the shared physical memory element; and

mapping a receiving memory element of the first virtual machine to the shared physical memory element.

11. (Canceled)

12. (Currently amended) The article of claim ~~[[11]]~~ 14, further including instructions providing for:

detecting that the first virtual machine has placed data in the shared physical memory element; and

informing the second virtual machine that data is available in the shared physical memory element.

13. (Canceled)

14. (Currently amended) ~~[[The]]~~ An article of claim 13, comprising:

a machine accessible medium having a plurality of machine accessible instructions, wherein when the instructions are executed, the instructions provide for:

detecting that a first virtual machine is attempting to transmit data to a second virtual machine;

mapping a transmitting memory element of the first virtual machine to a shared physical memory element; wherein the transmitting ~~buffer~~ memory element of the first virtual machine is part of a first virtual device; ~~[[and]]~~

mapping a receiving memory element of the second virtual machine to the shared physical memory element, wherein the receiving ~~buffer~~ memory element of the second virtual machine is part of a second virtual device;

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placing data from the first virtual machine into the shared physical memory element via the transmitting memory element;

receiving the placed data from the shared physical memory element into the second virtual machine via the receiving memory element;

detecting if the first virtual machine is attempting to transmit data to a non-virtual machine; and

dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element.

15. (Currently amended) The article of claim 14, wherein the first virtual device and the second virtual device are devices selected from a group including:

- an Ethernet device,
- a network interface,
- an audio device,
- a storage device, and
- a video device.

16. (Original) The article of claim 14, wherein the shared physical memory element is a direct memory access (DMA) buffer.

17. (Currently amended) The article of claim [[11]] 14, wherein the instructions provide for detecting that [[a]] the first virtual machine is attempting to transmit data to [[a]] the

second virtual machine includes instructions providing for:

monitoring the first virtual machine;

comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine.

18. (Currently amended) The article of claim ~~[[11]]~~ 14, wherein the instructions provide for detecting that ~~[[a]]~~ the first virtual machine is attempting to transmit data to ~~[[a]]~~ the second virtual machine includes instructions providing for:

reading a mapping configuration data for each of the respective first and second virtual machines that specifies default ~~virtual device~~ mapping for transmitting and receiving memory elements of the respective first and second virtual machines to physical ~~device mappings~~ devices;

comparing the mapping configuration data for the first virtual machine to the mapping configuration data ~~[[of]]~~ for the second virtual machine;

~~assuming~~ determining that the first virtual machine is attempting to transmit data to the second virtual machine~~[[,]]~~ if ~~[[a]]~~ the transmitting ~~virtual device~~ memory element of the first virtual machine is mapped to the same physical device as the receiving virtual device of the second virtual machine.

19. (Currently amended) The article of claim 17, wherein the instructions provide for mapping ~~[[a]]~~ the transmitting memory element of the first virtual machine to ~~[[a]]~~ the shared physical memory element includes instructions providing for:

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determining if the transmitting memory element of the first virtual machine is currently mapped to ~~a transmitting memory element of~~ a physical device;

if so, unmapping of the transmitting memory element from the ~~transmitting memory element of the~~ physical device; and

remapping the transmitting memory element of the first virtual machine to the shared physical memory element.

20. (Original) The article of claim 19, further including instructions providing for:

detecting that the second virtual machine is attempting to transmit data to the first virtual machine;

mapping a transmitting memory element of the second virtual machine to the shared physical memory element; and

mapping a receiving memory element of the first virtual machine to the shared physical memory element.

21-32. (Canceled)

33. (Currently amended) The computer-implemented system of claim ~~[[32]]~~ 34, wherein the cross-talk detector ~~[[is]]~~ further ~~capable of~~:

detecting that the first virtual machine has placed data in the shared physical memory element; and

informing the second virtual machine that data is available in the shared physical memory element.

34. (Currently amended) ~~[[The]]~~ A computer-implemented system of claim 32,
comprising:

a first virtual machine having a first virtual device that includes a first virtual memory element, the first virtual memory element including a transmitting element of the first virtual machine;

a second virtual machine having a second virtual device that includes a second virtual memory element, the second virtual memory element including a receiving element of the second virtual machine;

a shared physical memory element of a physical device, and to which the first and second virtual memory elements may be mapped;

a virtual machine manager having a cross-talk detector to detect if the first virtual machine is attempting to transmit data to the second virtual machine, wherein the cross-talk detector is further capable of detecting if the first virtual machine is attempting to transmit data to a non-virtual machine; and

a dynamic memory remapper to, if instructed by the cross-talk detector upon the cross-talk detector detecting that the first virtual machine is attempting to transmit data to the second virtual machine, map the first virtual memory element of the first virtual machine to the second virtual memory element of the second virtual machine via the shared physical memory element, including:

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mapping the transmitting memory element of the first virtual machine to the shared physical memory element; and
mapping the receiving memory element of the second virtual machine to the shared physical memory element;

wherein the dynamic memory remapper is further ~~capable of~~ dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element of the first virtual machine.

35. (Currently amended) The computer-implemented system of claim 34, wherein the cross-talk detector is further ~~capable of~~ monitoring the first and second ~~memories~~ virtual memory elements, wherein the ~~memories~~ first and second virtual memory elements are part of virtual devices selected from a group including:

- an Ethernet device,
- a network interface,
- an audio device,
- a storage device, and
- a video device.

36. (Currently amended) The computer-implemented system of claim 35, wherein the shared physical memory element is a direct memory access (DMA) buffer.

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37. (Currently amended) The computer-implemented system of claim 36, wherein the cross-talk detector is ~~capable of~~:

monitoring the first virtual machine;

comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine to detect if the first virtual machine is attempting to transmit data to the second virtual machine.

38. (Currently amended) The computer-implemented system of claim ~~[[32]]~~ 34, wherein the dynamic memory remapper is ~~capable of~~:

determining if the transmitting memory element of the first virtual machine is currently mapped to a physical transmitting memory element of a physical device;

if so, unmapping ~~[[of]]~~ the transmitting memory element of the first virtual machine from the physical transmitting memory element of the physical device; and

remapping the transmitting memory element of the first virtual machine to the shared physical memory element.

39. (Currently amended) The computer-implemented system of claim 38, wherein the cross-talk detector is ~~capable of~~ detecting that the second virtual machine is attempting to transmit data to the first virtual machine; and

wherein the dynamic memory remapper is ~~capable of~~ mapping ~~[[a]]~~ the transmitting memory element of the second virtual machine to the shared physical memory element; and

mapping ~~[[a]]~~ the receiving memory element of the first virtual machine to the shared physical memory element.

40. (Currently amended) The computer-implemented system of claim ~~[[31]]~~ 34, wherein the first virtual memory element of the first virtual machine as compared to ~~[[a]]~~ the second virtual memory element of the second virtual machine are not identical but share substantially similar characteristics.

41. (Previously presented) A method of communicating between two virtual machines utilizing a virtual machine manager comprising:

detecting that a first virtual machine, having a first virtual network interface, is attempting to transmit data to a second virtual machine, having a second virtual network interface, via the virtual network interfaces;

mapping a transmitting memory element of the first virtual network interface to a first direct memory access buffer;

mapping a receiving memory element of the second virtual network interface to the first direct memory access buffer;

placing data from the first virtual machine into the first direct memory access buffer via the transmitting memory element of the first virtual network interface;

receiving the placed data from the first direct memory access buffer into the second virtual machine via the receiving memory element of the second virtual network interface;

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mapping a receiving memory element of the first virtual network interface to a second direct memory access buffer;

mapping a transmitting memory element of the second virtual network interface to the second direct memory access buffer;

placing data from the second virtual machine into the second direct memory access buffer via the transmitting memory element of the second virtual network interface; and

receiving the placed data from the second direct memory access buffer into the first virtual machine via the receiving memory element of the first virtual network interface.

42. (Previously presented) The method of claim 41, further including:

detecting that the first virtual machine has placed data in the first direct memory access buffer;

informing the second virtual machine that data is available in the first direct memory access buffer;

detecting that the second virtual machine has placed data in the second direct memory access buffer; and

informing the first virtual machine that data is available in the second direct memory access buffer.

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43. (Previously presented) The method of claim 41, further comprising the first virtual machine:

placing at least one packet into the first direct memory access buffer; and
moving a tail register of the first virtual network interface to indicate how many packets where written to the first direct memory access buffer.

44. (Previously presented) The method of claim 43, further comprising the virtual machine manager:

moving a receive descriptor head register of the second virtual network interface by a number of packets written to the first direct memory access buffer;
updating the status of the second network interface to indicate that a packet has been received; and
sending a receive interrupt to the second virtual machine.

45. (Currently amended) The method of claim 44, further comprising the second virtual machine:

reading a packet from the first direct memory access buffer, wherein the packet is read from the number of packets previously written to the first direct memory access buffer.

46. (Previously presented) The method of claim 45, further comprising, the virtual machine manager:

detecting that the second virtual machine has read the packet from the first direct memory buffer;

updating the status of the first virtual network interface to indicate that the packet has been received; and

injecting a transmit complete interrupt to the first virtual machine.

47. (Currently amended) The method of claim 41, wherein detecting that the first virtual machine is attempting to transmit data to the second virtual machine includes:

monitoring the first virtual machine;

comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine.

48. (Currently amended) A method comprising:

detecting that a first virtual machine is configured to transmit data to a second virtual machine;

statically mapping a transmitting memory element of the first virtual machine to a shared physical memory element;

statically mapping a receiving memory element of the second virtual machine to the shared physical memory element;

placing data from the first virtual machine into the shared physical memory element via the transmitting memory element; and

receiving the placed data from the shared physical memory element into the second virtual machine via the receiving memory element;

detecting that the first virtual machine is configured to transmit data to a non-virtual machine; and

dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element.

49. (Currently amended) The method of claim 48, further comprising:

statically mapping a receiving memory element of the first virtual machine to a ~~second~~ the shared physical memory element;

statically mapping a transmitting memory element of the second virtual machine to the ~~second~~-shared physical memory element;

placing data from the second virtual machine into the ~~second~~-shared physical memory element via the transmitting memory element of the second virtual machine;
and

receiving the placed data from the shared physical memory element into the first virtual machine via the receiving memory element of the first virtual machine.

50. (Currently amended) The method of claim 48, wherein detecting that ~~[[a]]~~ the first virtual machine is configured to transmit data to ~~[[a]]~~ the second virtual machine is performed when the first virtual machine is started.

51. (Currently amended) The method of claim 50, wherein detecting that [[a]] the first virtual machine is configured to transmit data to [[a]] the second virtual machine includes reading a configuration file that explicitly denotes that the first and second virtual machines are virtually coupled.

52. (Currently amended) The method of claim 50, wherein detecting that [[a]] the first virtual machine is configured to transmit data to [[a]] the second virtual machine includes reading a configuration file that implicitly denotes that the first and second virtual machines are virtually coupled.

53. (Original) The method of claim 50, wherein the shared physical memory element comprises a direct access memory buffer.

54. (Currently amended) The method of claim 53, wherein the transmitting and receiving virtual memory elements of the respective first and second virtual machines are part of virtual devices selected from a group of virtual devices comprising:

- an Ethernet device;
- a network device;
- an audio device; a storage device; and
- a video device.

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55. (Currently amended) An article comprising:

a machine accessible medium having a plurality of machine accessible instructions, wherein when the instructions are executed, the instructions provide for:

detecting that a first virtual machine is configured to transmit data to a second virtual machine;

statically mapping a transmitting memory element of the first virtual machine to a shared physical memory element, wherein the transmitting memory element of the first virtual machine is part of a first virtual device; [[and]]

statically mapping a receiving memory element of the second virtual machine to the shared physical memory element, wherein the receiving memory element of the second virtual machine is part of a second virtual device;

placing data from the first virtual machine into the shared physical memory element via the transmitting memory element;

receiving the placed data from the shared physical memory element into the second virtual machine via the receiving memory element;

detecting if the first virtual machine is attempting to transmit data to a non-virtual machine; and

dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element.

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56. (Currently amended) The article of claim 55, further comprising instructions providing for:

statically mapping a receiving memory element of the first virtual machine to a ~~second~~ the shared physical memory element, wherein the receiving memory element of the first virtual machine is part of the first virtual device; and

statically mapping a transmitting memory element of the second virtual machine to the ~~second~~-shared physical memory element, wherein the transmitting memory element of the second virtual machine is part of the second virtual device.

57. (Currently amended) The article of claim 55, wherein the instructions providing for detecting that ~~[[a]]~~ the first virtual machine is configured to transmit data to ~~[[a]]~~ the second virtual machine are executed when the first virtual machine is started.

58. (Currently amended) The article of claim 57, wherein the instructions providing for detecting that ~~[[a]]~~ the first virtual machine is configured to transmit data to ~~[[a]]~~ the second virtual machine includes instructions providing for reading a configuration file that explicitly denotes that the first and second virtual machines are virtually coupled.

59. (Currently amended) The article of claim 57, wherein the instructions providing for detecting that ~~[[a]]~~ the first virtual machine is configured to transmit data to ~~[[a]]~~ the second virtual machine includes instructions providing for reading a configuration file that implicitly denotes that the first and second virtual machines are virtually coupled.

60. (Original) The article of claim 57, wherein the instructions provide for the shared physical memory element comprising a direct access memory buffer.

61. (Currently amended) The article of claim 60, wherein the transmitting and receiving virtual memory elements of the respective first and second virtual machines are part of virtual devices selected from a group of virtual devices comprising:

- an Ethernet device;
- a network device;
- an audio device; a storage device; and
- a video device.

-- END OF AMENDMENT --

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ERIC C. WAI whose telephone number is (571)270-1012. The examiner can normally be reached on Mon-Fri, 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng - Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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